Water Requirement of Irrigated Garlic

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Outline

- Introduction
- Project Overview
- Results
- Conclusions
Conclusions

- Water requirement for garlic 425 mm (16-17 inches)
- No difference in yield between 100 and 125% \( E_{\text{tc}} \)
  - Significant difference below 100% \( E_{\text{tc}} \)
- Peak \( K_{\text{tc}} \) – 1.3
Introduction

- Shift in cropping patterns on west side of the San Joaquin Valley
  - Reduction in water supply
  - Loss of drainage water disposal capacity

- Short season low water requirement crops
  - Lettuce
  - Peppers
  - Garlic

- No water requirement data for vegetable crop grown in this area
Materials and Methods

- Replicated trial - split plot with 4 reps
  - 3 irrigation systems
    - Flood/drip
    - Surface drip (SD)
    - Subsurface drip – buried 20 cm (SSD) (8 inches)
  - 4 irrigation levels
    - 50, 75, 100, 125% of ETc
- Planted October 10, 2005 and Harvest July 12-18, 2006
- Sprinkled for germination
Fig. 1. Vegetable crop field layout at the University of California West Side Research and Education Center located near Five Points, CA. Split plot design with three irrigation methods (M₁, M₂, M₃) as main plots and four irrigation levels (L₁, L₂, L₃, L₄) as subplots, in four replications. Each subplot is 270 feet long and consists of four 40-inch wide beds. Irrigation levels are based on a percentage of the crop lysimeter evapotranspiration (ETₗys). M₁ = furrow, M₂ = surface drip, and M₃ = subsurface drip; L₁ = 50% ETₗys, L₂ = 75% ETₗys, L₃ = 100% ETₗys, and L₄ = 125% ETₗys. B = border rows.
M and M Cont’d

- Soil – Panoche silt clay loam
- Weighing lysimeter used to measure Etc
- Irrigation Management
  - Accumulate 1 mm ETc to irrigate Lysimeter and SSD
  - Accumulate 2 mm ETc to irrigate drip field (SD)
  - Flood/drip irrigated weekly equal to accumulated Etc
    - ETc accumulation modified by irrigation treatment
- CIMIS weather station used for reference ET
- Weighing grass lysimeter also used for reference ET
- Canopy cover measured with IR camera
Photographing Canopy Size
Results
# Market Yield, total weight, cull weight an soluble solids by irrigation level

<table>
<thead>
<tr>
<th>Irrigation Level % ET&lt;sub&gt;c&lt;/sub&gt;</th>
<th>Market Yield (Mg/ha)</th>
<th>Total Weight (Mg/ha)</th>
<th>Cull Wt (Mg/ha)</th>
<th>Soluble Solids (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>13.15*</td>
<td>20.16*</td>
<td>1.29*</td>
<td>36.61*</td>
</tr>
<tr>
<td>75</td>
<td>16.70*</td>
<td>23.76*</td>
<td>1.09*</td>
<td>36.63*</td>
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<tr>
<td>100</td>
<td>19.80</td>
<td>26.95</td>
<td>0.8</td>
<td>35.86</td>
</tr>
<tr>
<td>125</td>
<td>20.17</td>
<td>27.65</td>
<td>0.87</td>
<td>35.12</td>
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<tr>
<td>SE</td>
<td>488</td>
<td>0.57</td>
<td>0.06</td>
<td>0.213</td>
</tr>
</tbody>
</table>

*Significantly < 100% ET<sub>c</sub> by Dunnett’s one tailed test (p<0.05)
<table>
<thead>
<tr>
<th>Irrigation Type</th>
<th>Soluble Solids (%) Mean</th>
<th>100 Bulb Weight (kg) Mean</th>
<th>SE (bulb weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood</td>
<td>35.94a</td>
<td>4.82a</td>
<td>0.31</td>
</tr>
<tr>
<td>Surface Drip</td>
<td>35.58a</td>
<td>4.98ab</td>
<td>0.44</td>
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<tr>
<td>Subsurface drip</td>
<td>36.89b</td>
<td>5.22b</td>
<td>0.31</td>
</tr>
<tr>
<td>SE (SS%)</td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means not followed by the same letter are significantly different (p<0.5) by Tukey’s multiple range test.
Crop coefficient ($K_c$)

- $k_c$-CIMIS
- $K_c$-Grass Reference
- Crop cover
Conclusions

- Water requirement for garlic 425 mm (16 – 17 inches)
- No difference in yield between 100 and 125% $E_{t_c}$
  - Significant difference below 100% Etc
- Peak $K_c$ – 1.3
Acknowledgements

- Mr. Jim Gartung
- California Department of Water Resources
- California State University, Fresno – Agricultural Research Initiative